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Site 48UT375: Late Paleoindian Period Subsistence and Land Use Patterns in the Green River Basin, Wyoming

Craig S. Smith, Thomas P. Reust, and Russell D. Richard

ABSTRACT

Excavations at Site 48UT375 in the Green River Basin of southwest Wyoming provide an excellent opportunity to explore subsistence and land use patterns in a high elevation, sagebrush-covered intermountain basin during the late Paleoindian period. Excavations at this site uncovered large quantities of heat-altered rock situated around several hearth features that were radiocarbon dated between 8,600 and 8,300 years ago. Each of these hearth features contained hundreds of highly fragmented and carbonized bone specimens representing small mammals, predominantly rabbits. In addition to the opportunistic procurement of small mammals for immediate consumption, the site occupants probably extensively processed some resource such as biscuitroot obtainable from the playa adjacent to the site. Another component dating to 7890 years ago and representing similar activities was also excavated. Comparisons with other excavated sites dating to this period in the Green River Basin including Sites 48UT786 and 48LN1185 and the Vegan and Blue Point sites indicate similar subsistence patterns. Each of these sites also contained evidence of a series of later intermittent occupations dating throughout the mid-Holocene, suggesting that these site localities were the focus of repeated reuse during this period.

Keywords: late Paleoindian Period, southwest Wyoming, land use patterns, small mammal procurement

Obtaining a clearer picture of how the prehistoric peoples lived during the period between 9,000 and 8,000 years ago is important for a complete understanding of the sequence of prehistoric use of the Rocky Mountains and adjacent Northwestern Plains. This period of transition between the late Paleoindian and Early Archaic periods is complex and diverse and is less known then the preceding and succeeding periods. Most discussions concerning the late Paleoindian period in the Rocky Mountains and foothills recognize differences in projectile points and subsistence with adjacent regions, especially the Northwestern Plains (Pitblado 1999). Husted (1969), from his work in the Big Horn Canyon and at Mummy Cave of northern Wyoming, was one of the first to note a distinction during this period between the human adaptations of groups living in the Rocky Mountains and those exploiting the resources of the Plains.

Frison (1976, 1988, 1992, 1997), in a series of papers, has contributed to the understanding of this dichotomy between the Rocky Mountains and Northwestern Plains. He defined the Foothill-Mountain complex to distinguish the late Paleoindian period of the Big Horn Mountains and Basin with that of the Northwestern Plains. One of the major differences between the two areas is the projectile point assemblages. In contrast to the typical Northwestern Plains late Paleoindian projectile point sequence as exemplified at the Hell Gap site, sites such as Mummy Cave and Medicine Lodge Creek in the foothills and mountains con-

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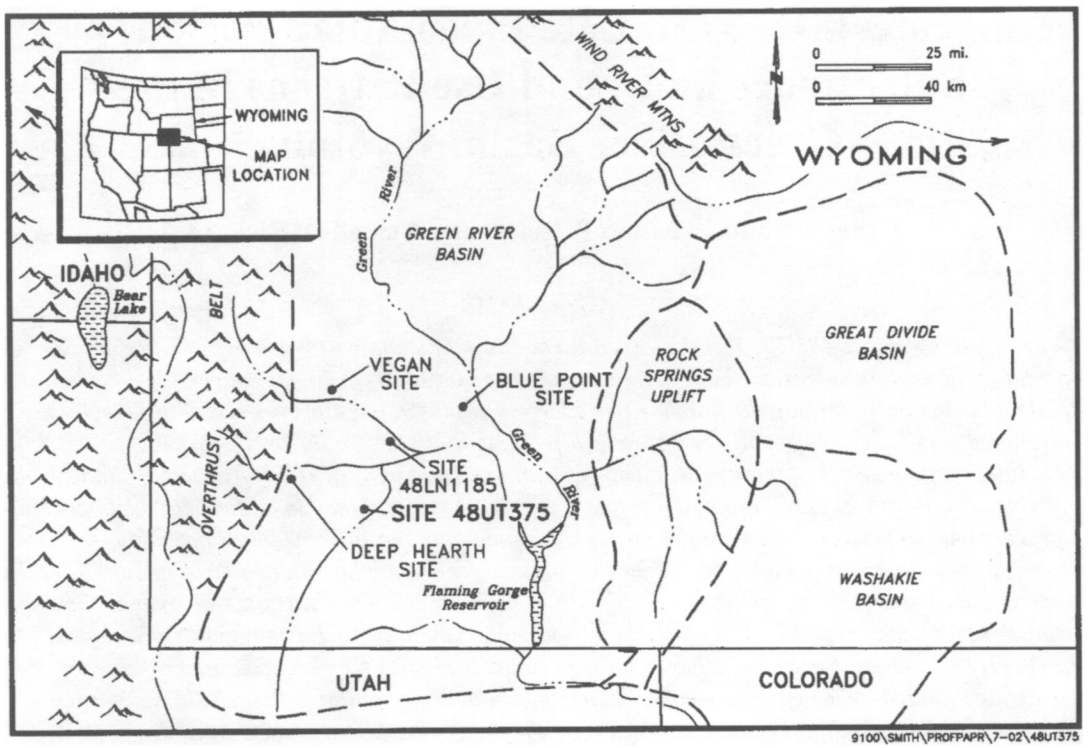

Figure 1. Map of southwest Wyoming showing location of Site 48UT375 and other discussed sites.

tain a variety of lanceolate, laterally restricted projectile points with parallel-diagonal flaking patterns including Pryor Stemmed and Lovell Constricted. Frison also recognized that sites in the foothills and mountains contrast with the typical Northwestern Plains sites in that they contain mostly artifacts made from local materials and lack evidence for communal kills of large animals such as bison. He attributed this dichotomy to ecological differences in the resource base between the two areas.

Pitblado's (1999) study of late Paleoindian projectile points in the Southern Rocky Mountains has also provided important insights regarding the use of the mountains compared to surrounding regions. Her study examined differences in the morphology, typology, raw material, and technology of projectile points from the Plains, Southern Rocky Mountains, Colorado Plateau, Great Basin Mountains, and Great Basin. She concluded from her analysis that during the late Paleoindian period some groups were uniquely adapted allowing them to use the Southern Rocky Mountains full-time; groups from the Plains spent time in the mountains on a seasonal basis; and other groups from the east and west made sporadic visits to mountains. She also argued that most of these groups in the Rocky Mountains followed logistical mobility strategies.

Much of what is known of the late Paleoindian period of the mountain and foothill areas of Wyoming comes from sites such as Sorenson, Bottleneck, and Magnus (Husted 1969), Medicine Lodge Creek (Frison 1976), Mummy Cave (Husted and Edgar 2002), and Lookingbill (Frison 1983) located in the mountains and foothills of northern Wyoming. Less is known about the late Paleoindian period inhabitants of the Wyoming Basin, a series of high-elevation, arid, sagebrush-covered intermountain basins surrounded by the Southern and Central Rocky Mountains in southwest Wyoming. One of these high, intermountain basins is the Green River Basin. It occurs at an elevation between approximately 1,825 and 2,430 m and is surrounded by mountains and uplifts that approach over 3,650 m in elevation. Over the past decade, several sites dating between 9,000 and 8,000 years

Figure 2. View of excavation in progress showing the playa area along Austin Wash in the background, looking southeast.

ago have been excavated in the Green River Basin, providing an opportunity to explore the subsistence of the prehistoric people and learn more concerning this transitional period (Figure 1).

The excavation of these sites in the Green River Basin also affords a chance to examine hunter-gatherer long-term land use patterns from the late Paleoindian period through the mid-Holocene. Considering these land use patterns at various scales can contribute to a broader understanding of hunter-gatherer settlement decisions. Land use patterns can be studied at the scale of the larger overall locality or the general area encompassing a number of occupation locations adjacent to crucial resources or patches (Smith and McNees 1999). The selection of a particular locality for occupation would depend on the presence and availability of these resources. The repeated occupation of a locality over the long-term suggests that these areas were the most optimally situated to necessary resources in heterogeneous environments where these resources were patchy or rare (Binford 1982; Brooks and Yellen 1987). These revisits may have been made annually or may have been more cyclical and dependent on the regeneration of the exploited patches.

Land use patterns may also be beneficially investigated at the scale of the smaller location or the specific place on the landscape used for an occupation. The decision of whether to focus repeated occupations at the same location or to return to different locations within the same locality is often the product of the interplay of positive and negative factors that affect the desirability of particular locations through time (Binford 1983; Brooks and Yellen 1987; Dewar and McBride 1992; Wandsnider 1992). Those locations with special or unique characteristics such as protection from the wind, easy access to water or other resources, or well-drained surfaces would be the most desirable for selection for occupation. Acting against this bias for occupation of locations containing the most favorable natural features would be the accumulation of debris and unwanted pests and the depletion of resources resulting from repeated use. These negative modifications to a location would force the selection of other locations until the natural regeneration of the more advantageous ones. Human enhancements to a location including the construction of enduring facilities may also increase the desirability of a location for repeated occupations (Smith and McNees 1999). Wandsnider (1992:258) discusses this interplay of factors influencing location selection as "locale use tempo" or "the frequency and syncopation with which a specific area (i.e., locale) is used."

THE SITE

Site 48UT375 is a large multicomponent site measuring over 0.5 km in length that is situated on a low interfluvial ridge about 250 m west of Austin Wash, a locally prominent ephemeral drainage (Figure 2). Austin Wash occurs within a broad, poorly drained basin with alkaline playas. Much of the site is located within a large dunal area that has accumulated on the east edge of the low east/west-aligned ridge that overlooks the basin containing Austin Wash. The site vicinity supports sagebrush steppe vegetation, which is characterized by a mosaic of shrublands. A moderately dense overstory of sagebrush and an understory of grasses and forbs blanket the site and surrounding areas. Gardner's saltbush and greasewood are common

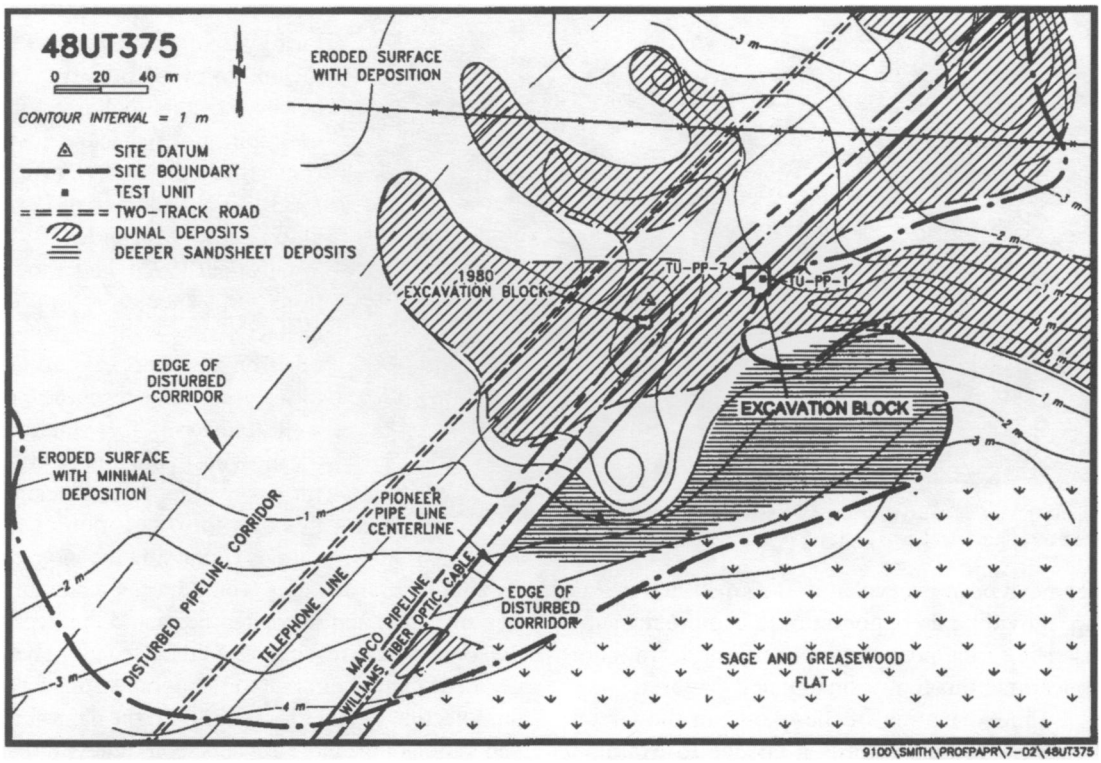

Figure 3. Map of Site 48SW375 showing location of excavation block, previous excavations, and pipeline corridor.

in the more poorly drained, alkaline soils in the basin along Austin Wash to the east. On the surface, the site consists of a number of eroded hearth features and heat-altered rock concentrations, dense flake concentrations, and a generalized scatter of flaked stone artifacts and heat-altered rock. A wide pipeline and telecommunications corridor has disturbed the eastern and southern portions of the site exposing additional prehistoric remains, often in dense concentrations.

A 122-m^2 block was excavated on the northern slope of the ridge within an area characterized by the accumulation of moderately deep aeolian deposits (Figure 3). The southern edge of the block was within deeper dune deposits near the crest of the ridge; the northern portion of the block extended downslope from the crest into shallower deposits. The natural stratigraphy within the excavation block included regolith and residuum underlying the aeolian deposits (Figure 4). The aeolian deposits continued from the surface to a maximum depth of 118 cm and consisted of a massive to weakly parallel bedded, silty fine sand. This sand contained the prehistoric artifacts and features recovered during the excavations.

Four prehistoric components were identified as a result of the excavations of the 122-m^2 block: Component I dates to the transitional late Paleoindian/Early Archaic period between 8,600 and 8,300 years ago and was documented across the entire excavation block at depths greater than 50 cm below surface; Component II belongs to the late Paleoindian/Early Archaic period transition dating at 7,900 years ago and was defined only in the southeastern portion of the block at about 30 to 40 cm below surface; Component III dates to the Middle Archaic period between 4,200 and 4,000 years ago and was recognized across the block at about 30 cm below surface; and Component IV is an undated ephemeral component consisting of artifacts scattered in the upper 20 cm of deposits that appears to belong to the Late Archaic/Late Prehistoric period (Tables 1 and 2). The results from the late Paleoindian and late Paleoindian/Early

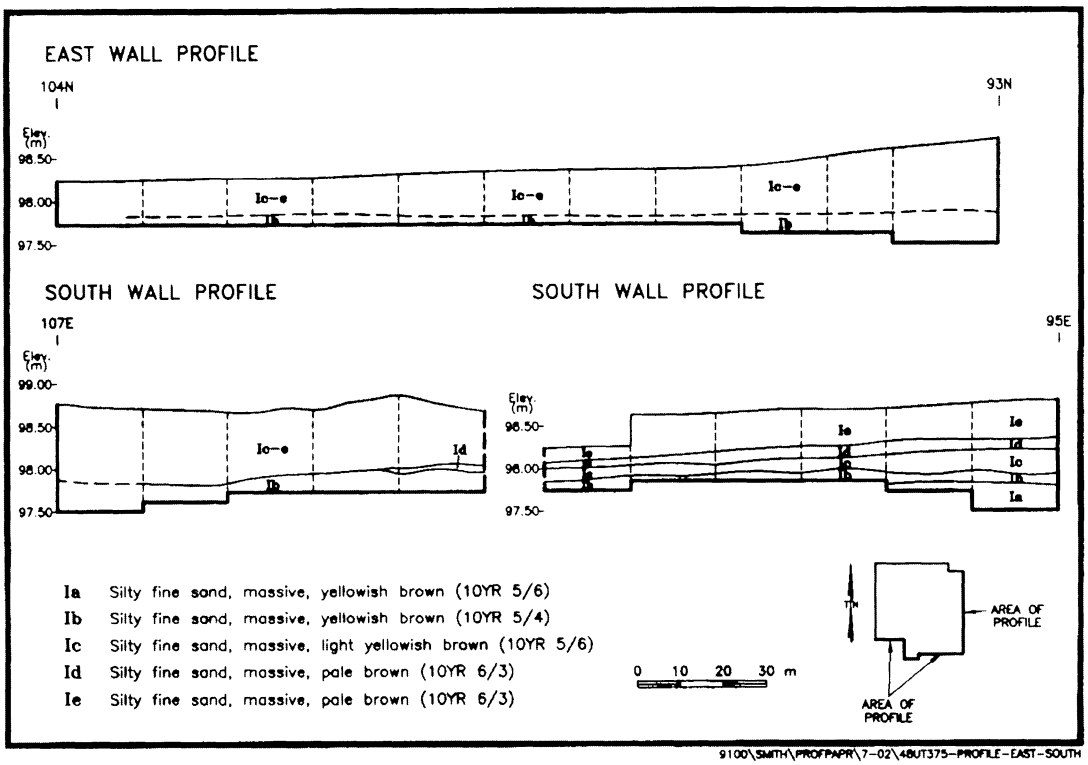

Figure 4. Stratigraphic profile of east and south walls of excavation block.

Archaic period Components I-II are summarized below. The two later components are detailed in Reust et al. (2002). An additional 25-m^2 block excavated about 40 m to the southwest in 1981 resulted in the recovery of six basin features, charcoal-stained sediment, heat-altered rock, and artifacts dated at 5,690 and 5,360 years ago (Angulski 1982).

THE LATE PALEOINDIAN COMPONENT I

For Component I, the excavation block contained 18 charcoal-filled basin features and two heat-altered rock concentrations spatially grouped into three distinct clusters, each consisting of basin features and two with a heat-altered rock concentration (Figure 5; Table 2). The North Cluster included a heat-altered rock concentration (Feature 5) measuring 326 x 226 cm and four basin features (Features 10, 12, 13, and 15) with an average size of 49 x 46 x 27 cm. The single radiocarbon date from the North Cluster was 8450 ± 40 years B.P. (Beta-153340; charcoal). The West Cluster had a heat-altered rock concentration (Feature 4A) measuring 293 x 260 cm and four basin features (Features 7, 9, 11, and 18) with an average size of 49 x 47 x 23 cm. The cluster also had a shallow charcoal-stained area partially filled with rock (Feature 4B) measuring 132 x 107 x 12 cm. Radiocarbon dates from features within the cluster were 8470 ± 40 B.P. (Beta-153340; charcoal) and 8330 ± 40 years B.P. (Beta-151914; charcoal). The South Cluster, located in the southwest corner of the block, had eight basins (Features 14, 16, 17, 19, 21, 22, 23, and 24) of various sizes. The two radiocarbon dates from the South Cluster were 8640 ± 40 B.P. (Beta-151912; charcoal) and 8490 ± 40 years B.P. (Beta-151913; charcoal). Although a heat-altered rock concentration was not recorded in association with the South Cluster, one probably occurs in the unexcavated areas east of the cluster. The unit along the eastern edge of the excavation block contained 486 heat-altered quartzite fragments, and these rocks probably constitute

Table 1 Uncorrected and Calibrated Radiocarbon Age Estimate, Site 48UT375.

Laboratory No. (Beta-)	Component	Feature No.	Uncorrected Age (Years B.P.)	Calibrated Age (Two Sigma)* B.P.	B.C.	Dating Techniques
151911	III	1	4,220 ± 40	4,860-4,810; 4,760-4,700; 4,670-4650	2910-2860; 2810-2750; 2720-2700	AMS
151909	III	3	4,040 ± 40	4,620-4,420; 4,800-4,770	2850-2820; 2670-2470	AMS
151917	III	2B	4,030 ± 70	4,710-4,750; 4,710-4,350; 4,330-4,300	2860-2800; 2760-2400; 2380-2360	Radiometric
151910	II	8	7,890 ± 40	8,970-8,910; 8,790-8,590; 8,870-8,830	7020-6960; 6920-6880; 6840-6640	AMS
151912	I	21	8,640 ± 40	9,700-9,540	7750-7590	AMS
151913	I	23	8,490 ± 40	9,540-9,480	7590-7530	AMS
151916	I	7A	8,470 ± 40	9,530-9,450	7580-7500	AMS
153340	I	12	8,450 ± 40	9,520-9,430	7580-7480	AMS
151914	I	4	8,330 ± 40	9,470-9,270	7520-7320	AMS

* Calibrated dates provided by Beta Analytic and calculated using the INTCAL 98 dataset (Stuiver et al. 1998)

the western edge of a heat-altered rock concentration similar to the other two.

Each of these three feature groupings was similar and probably represents a similar range of activities, which involved fairly large quantities of heat-altered rock and adjacent basins filled with charcoal-stained sediment. It is unclear whether the three areas were used at the same time or on different occasions, though the radiocarbon ages are grouped relatively tightly between 8,640 and 8,330 years ago, suggesting that the possible different occupations were spaced closely in time.

Recovered stone artifacts included 15 bifaces, 18 flake tools, three cores, three tested cobbles, a modified cobble, and 3,514 pieces of debitage. No diagnostic projectile points were present. At least five large bifaces (classified as final blanks and performs based on reduction stage) that exhibit usewear along most of their margins were part of the assemblage (Figure 6). The complete bifaces measured 12.5-13.7 cm in length and 5.6-5.8 cm in width. They were made of both quartzite and algalitic chert, material that could be easily obtained from near the site. One of the site activities probably involved the use and/or production of these large bifaces. The 18 flake tools contained either limited marginal retouch or macroscopic usewear generally along only one margin, suggesting only limited expedient use. Over 60% of the debitage was quartzite, followed by opaque chert at about 18% and algalitic chert at 16%. All the recovered material types are from nearby sources and materials brought in from a far distance appear not to have been a factor. Large quantities of good-quality toolstone occur near the site vicinity, making the site location an ideal place for retooling and obtaining toolstone. The distribution of the various sizes of quartzite and chert debitage suggests that mostly the initial and the earlier stages of reduction occurred at the site, which is expected given the large quantity of toolstone near the site. Many of the bifaces were probably made for later use, and only the broken ones and other discards were left behind, while the expedient flake tools

Table 2 Characteristics of Cultural Features, Component I.

Feature No.	Type	L[1]	W[1]	D[1]	Heat-altered Rock Area (cm^2)	Heat-altered Rock No.	Heat-altered Rock Weight (kg)	Debris in Fill	Comments
4A	Heat-altered rock concentration	293	260	—	59,832	1,221	34.49	Modified cobble (UT375-1125); 16 debitage	Associated with Feature 4B
4B	Basin	132	107	12	11,093	41	1.5	7 bone; 4 debitage	Associated with Feature 4A; 8,330 ± 40 years B.P.
5	Heat-altered rock concentration	362	226	—	64,255	1,890	56.5	60 bone; 2 blanks (UT375-1148, -1164); 2 final bifaces (UT375-1153/1160,-1154); core (UT375-1147); flake tools (UT375-1139, -1141, -1157, -1167, -1168); 430 debitage	Likely associated with Features 10, 12, 13, and 15
7	Basin	100	86	8	6,754	53	4.8	60 bone, 10 debitage	—
7A	Basin	55	55	30	2,374	—	—	14 bone	Discrete basin extends from base of Feature 7; 8,470 ± 40 years B.P.
9	Basin	49	48	15	1,847	7	3.1	40 debitage	—
10	Basin	42	40	26	1,319			276 bone	—
11	Basin	46	45	22	1,626	4	0.04	—	—
12	Basin	55	52	31	2,246	—	—	6 debitage	8,450 ± 40 years B.P.
13	Basin	50	49	27	1,924	21	0.45	95 bone, 6 debitage	—
14	Basin	39	21	4	643	—	—	40 bone, utilized flake (UT375-1186), 2 debitage	—
15	Basin	47	42	22	1,550	—	—	380 bone, blank (UT375-1186), 3 debitage	—
16	Basin	42	40	4	1,319	1	0.025	28 bone	—
17	Basin	155	92	24	11,200	19	2.47	588 bone	—
18	Basin	43	40	23	1,351	—	—	6 bone	—
19	Basin	37	33	15	959	—	—	103 bone	—
21	Basin	43	42	20	1,418	—	—	595 bone	8,640 ± 40 years B.P.
22	Basin	40	40	19	1,257	4	0.04	238 bone, metate fragment (UT375-1191)	—
23	Basin	90	45	19	3,181	2	0.175	371 bone, 3 debitage	8,490 ± 40 years B.P.
24	Basin	65	55	3	2,808	—	—	29 bone	—

[1] All measurements in cm; L = length; W = width; D = depth.

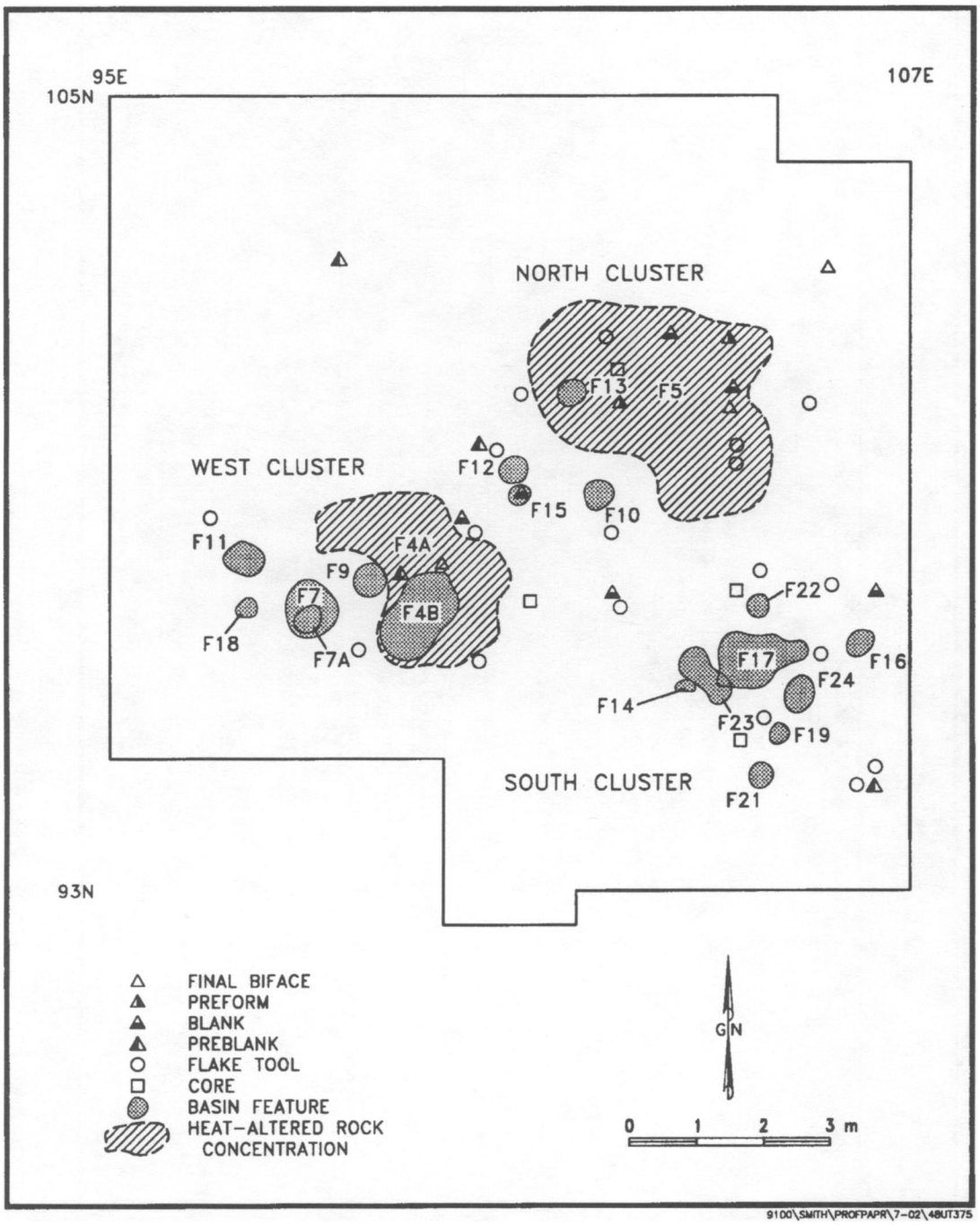

Figure 5. Spatial distribution of features and tools, Component I.

were for immediate use and were then discarded at the use location. A fragment of a mano and a metate were also recovered.

A projectile point that resembles a late Paleoindian period type was recovered from deposits assigned to the mid-Holocene Component III, but probably originated from the late Paleoindian period Component I. The projectile

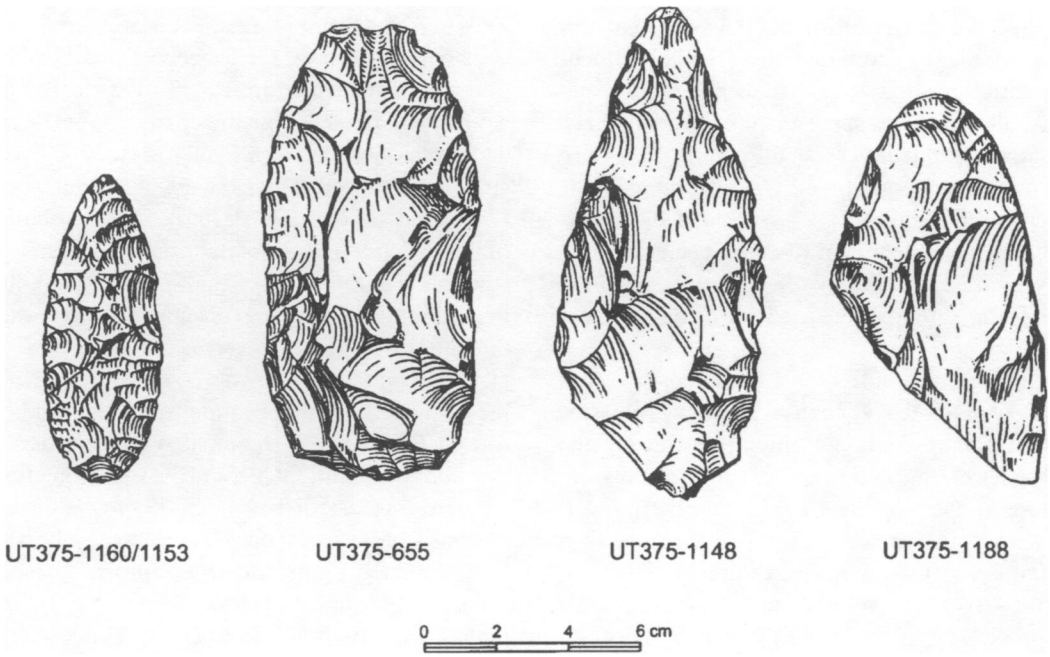

Figure 6. Selected large bifaces, Component I.

point is a refitted base and medial portion of local algalitic chert that is lanceolate-shaped with a slight constriction of the lateral basal edges resulting in a slight "fishtail" appearance (Figure 7). It has a parallel oblique flaking pattern without basal grinding. This point is similar to the one found at the nearby late Paleoindian period Deep Hearth site that was classified as a Deception Creek type (Rood and Pope 1993).

A total of 3,190 bone fragments were recovered from this transitional late Paleoindian/Early Archaic component. Over 98% (n = 3,131) of these bone fragments were obtained during flotation from basin feature fill. The remaining 59 fragments were scattered throughout the site, primarily in units adjoining the features. Feature 21 in the South Cluster contained 595 specimens or 19% of the total feature bone, followed by Feature 17 with 588 fragments, Feature 15 with 380 fragments, and Feature 23 with 371 fragments. All the features yielded at least some bone fragments. All the recovered bone were extremely fragmented, and over 98% were less than 0.5 cm in size. Over 66% of the fragments were burned. All of the bone from Feature 7A was burned, and other features contained from 91% burned to no burned bone in Feature 4B, which produced only seven fragments.

Because of the fragmentary nature of the collection, only 36 specimens were identified to taxon based primarily on teeth. Twenty-six specimens from five features were classified as *Sylvilagus* sp. (cottontail), three specimens from two features as an unknown cricetine (mouse), and seven speci-

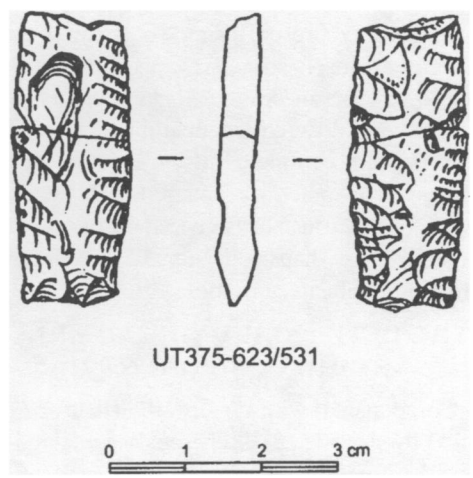

Figure 7. Projectile point, Component III.

mens from two features as *Neotoma* sp. (probable woodrat). One eggshell fragment was also part of the assemblage. The remaining 3,153 specimens were sorted only to size class. Except for four specimens, all were very small mammal, rodent-sized mammal, or rodent-very small mammal. No animal larger than a cottontail was identified in the collection. The entire bone assemblage may represent only a single animal of each species, though more animals would have been processed if the three feature groups were used during different occupations.

Though a sample of fill from most features was floated to recover charred plant macrofossils, the only charred remains identified during the analysis were an unknown berry fragment from Feature 7, one *Artemisia* sp. (sagebrush) flowering stem from Feature 11, and two *Chenopodium* sp. (goosefoot) seeds from Feature 12. This limited recovery of charred plant remains indicates that the processing of seeds most likely did not transpire at the site during late Paleoindian times. As Smith (1988) noted, the extensive processing of seeds was probably not an important component of subsistence activities in southwest Wyoming until the Late Prehistoric period.

Overall, the excavation block contained three similar clusters of remains or activity areas, each with a concentration of heat-altered rock, at least four charcoal-stained basin features, large bifaces, expedient retouched flakes, and extremely fragmentary remains of cottontail, mouse, and woodrat found in the features. It is unclear whether the three identical areas represent a single occupation event or a series of closely spaced revisits to the site over a period of years or decades. If they were the result of several different occupations, then similar activities were completed at the location during each visit. The material recovered from the excavation block may also be from a single event where a larger group perhaps consisting of three families performed duplicate activities.

THE LATE PALEOINDIAN/EARLY ARCHIC COMPONENT II

Component II with a radiocarbon date of 7,890 ± 40 B.P. (Beta-151910; charcoal) contained remains that represent similar activities as those indicated for the late Paleoindian period Component I. Component II yielded three basin features (Features 6, 8, and 20), 171 pieces of heat-altered rock, one biface, two cores, a tested cobble, and 67 pieces of debitage recovered from a 13-m^2 area. The basin features ranged in diameter from 45 to 55 cm, and depths were between 15 and 22 cm. The flaked stone artifacts and debitage were of local quartzite (70%) and various cherts (30%). The distribution of the various sizes of quartzite and chert debitage suggests that the focus of the flaked stone reduction activities during this occupation was mostly the initial and the earlier stages of reduction. A total of 26 bone fragments was obtained from two of the features (two from Feature 6 and 24 from Feature 20). One tooth fragment was identified as *Sylvilagus* sp. (cottontail), and the remaining fragments were classified as rodent-very small mammal and very small mammal size classes. The bone was extremely fragmentary and probably represents the opportunistic procurement of a single cottontail. Only two charred *Chenopodium* sp. seeds were recovered from Feature 8, indicating that the collection and processing of seeds did not occur during this occupation. The limited recovered remains suggest that a single short-term occupation is represented.

SUBSISTENCE AND SITE ACTIVITES

One obvious activity represented at the three Component I activity areas is the preparation and consumption of cottontail, mouse, and woodrat. These small mammals were probably opportunistically caught or snared in the vicinity of the camp. Rabbits may also have been actively hunted. As evidenced by the presence of fragmented and burned bone scattered among many of the basin features, the entire carcasses of these small mammals were probably crushed to a pulp and then stewed or roasted over a fire in the basin features and eaten. Groundstone could have been used in the crushing of these animals (Yohe et al. 1991). Much of the fragmentation of the bone probably was due to the intensive processing, though some of the fragmentation probably occurred as a result of postoccupation depositional factors as well. The animals were processed to extract the maximum nutritional value perhaps suggesting the site occupants were subsisting under stress conditions and that any food was highly valued (Quirt-Booth and

Cruz-Uribe 1997); however, burned and extensively fragmented small mammal bones appear to be the norm for assemblages of this type (Douglas et al. 1988; Shaffer 1992).

Though processing and consumption of small mammals was one important activity during the Component I late Paleoindian times, it was probably secondary to the major focus of the occupation at that location. The presence of large quantities of heat-altered rock, 17 basin features, expedient retouched flakes, and large bifaces suggests that other more intensive processing activities were also important. The roasting of small mammals would have required only a small fire. Direct evidence for the activity necessitating the more extensive materials and basins is lacking but is probably related to resources that would have been available from the wetter, poorly drained playa areas near the site. The presence of playas, a fairly rare feature on the landscape in the area, may have directed the selection of the overall site or locale. The sand deposits on the lee side of the ridge near the playas provided an ideal, well-drained campsite with small mammals and easy access to the playas.

The actual resource that would have been available is unknown, but various root or bulb plants such as biscuitroot and onion have been observed in the playa areas in the spring. The Eckerle and Taddie (2002) model, which compares soil types, vegetation, and climate during different periods, shows that Site 48UT375 falls within the general range of biscuitroot during the time of the late Paleoindian period occupations. Additionally, biscuitroot may have occurred in the wetter playa areas throughout most of the late Paleoindian and mid-Holocene times. The root resource may have been boiled in containers such as baskets using rocks heated in the basin features. Boiling water usually requires large quantities of rocks that are discarded once they are fractured and broken into small pieces. The expedient retouched flakes recovered from the excavation block may also have been useful in this processing. The large bifaces found at the site may represent other gearing-up activities using the abundant quartzites and cherts scattered over the immediate area. The lack of recovered large and medium mammal remains at the site indicates that these kinds of animals at least were not associated with the intensive processing evident at the site. If a resource such as biscuitroot was the focus of the activities at the site, then it was probably occupied during the early spring.

The presence of basin features and heat-altered rock indicates that Component II represents, like Component I, activities associated with processing some resource collected from the playa and wetter areas adjacent to the site. The resource may have been a root plant such as biscuitroot. Animals exploited during each of the two periods of occupation were primarily small mammals (cottontail and rodents). No evidence of the hunting or processing of larger mammals such as bison is present from the current excavations at the site. The exploited animals appear to have been intensively processed in a similar manner throughout the occupational history of the excavated portion of the site, as indicated by the recovery of only extremely fragmented bone that is at least partly the result of human activities. Component III, dating to the mid-Holocene at 4,200 and 4,000 years ago, also represents similar site activities as the two earlier late Paleoindian components.

LAND USE PATTERNS AT SITE 48UT375

Apparently, the location of the excavation block within a sand dune adjacent to a playa and wetter areas along Austin Wash was visited and used on at least three occasions (more times if the three Component I feature groups represent different occupations) over approximately 4,000 years to perform at least some similar type of activities. These few, intermittent visits to the portion of the sand dune containing the 122-m^2 excavation block suggest that the actual location was not an important focus for reoccupation. The excavated location was not unique or afforded any better advantage than the numerous other locations throughout the dune field or locality recorded as Site 48UT375. The hunter-gatherers had a wide choice of similar and adequate locations to occupy within the sand dunes in the immediate area. The presence of remains and facilities from previous visits appears not to have served as a draw to reuse the same camp during subsequent returns. These previous remains and trash may actually have discouraged closely spaced reoccupations of the same location due to

the build up of unwanted debris or pests. In addition to unique natural features, the construction of some type of long-term facility such as slab-lined basins or pit houses may provide some sort of marker on the landscape and a reason to return to the exact same spot or location (Smith and McNees 1999). These more permanent facilities were apparently not constructed at the site, at least in the area of the excavation block.

Though the hunter-gatherers did not always revisit each particular location such as the area of the excavation block on a continual and regular basis, the larger locality consisting of a series of sand dunes recorded as Site 48UT375 appears to have been regularly visited over the 4,000 years from about 8,500 to 4,000 years ago. In addition to the remains recovered from the excavation block, extensive occupation debris is evident throughout the sand dune areas of this locality recorded as Site 48UT375. The surface of the sand dunes contains a number of eroded hearth features, heat-altered rock concentrations, dense flake concentrations, and other artifacts. Previous excavations for the MAPCO pipeline in an area near the current excavation block produced evidence of six basin features, charcoal-stained sediment radiocarbon dated at 5,690 and 5,360 years ago, heat-altered rock, and artifacts within a 25-m^2 area (Angulski 1982). Several features were also noted on the site during the construction inspection of the site for the MAPCO pipeline project. Fifteen features and other remains belonging to at least four archaeological components were recorded and investigated during the construction monitor and test excavations for the Pioneer pipeline project following the current block excavations (McClelland and Fleming 2002; McClelland et al. 2001). Charcoal from two of the features were radiocarbon-dated at 8,330 and 4,260 years ago, providing additional evidence of reuse of the locality over a 4,000-year period. Additional remains including flaked stone artifacts and heat-altered rock were observed within the Williams Communications bladed right-of-way adjacent to the Pioneer pipeline right-of-way.

The locality recorded as Site 48UT375 appears to have been the important focus for reoccupation, while the regular reuse of the actual locations within the locality did not play as critical a role in settlement decisions. In terms of Dewar and McBride's (1992) scale of "spatial congruence" or degree that a location and locality were reused, the settlement pattern associated with Site 48UT375 would be considered "localized" where remains from various occupations are restricted to a general locality, with a number of overlapping or adjacent loci of cultural remains. Complete spatial congruence or the use of the same space at a location in a similar manner during each occupation did not typically occur at the locality recorded as Site 48UT375. The interval and pattern of occupations at Site 48UT375 over the 4,000 years is unclear. Revisits may have been made annually or may have been more cyclical where the locality was part of one of several core areas of a group's territory as described for the Nunamiut by Binford (1983). The possible periodicity of use of the locality may have also been the result of alternating use between different localities, allowing associated resource patches to regenerate. Regardless of the patterning of the occupations, the locality recorded as Site 48UT375 was visited and occupied on numerous occasions over the 4,000-year period and was a major point of convergence for occupation on the landscape. The use of this locality appears to be at least in part for similar activities.

A localized settlement pattern focusing on revisits to particular localities on the landscape suggests that these areas were the most optimally situated to critical resources such as water holes and productive resource patches in heterogeneous environments where these important resources were patchy or rare (Binford 1982; Brooks and Yellen 1987). The chosen locality for repeated use would have to provide the best solution to positioning a group to exploit differentially distributed resources. The sand dunes at the locality recorded as Site 48UT375 afforded a well-drained sandy area that supported a diversity of plants and abundance of small mammals, an important resource for the hunter-gatherer occupants. This sand dune area was adjacent to a playa and floodplain that would have supplied water and probably a resource such as biscuitroot that may have been processed at the locality.

The continuance of this localized settlement pattern and the use of this locality for several thousand years from about 8,500 to 4,000 years ago indicate that the conditions that made the locality

a favorable campsite persisted throughout this period. This period is typically interpreted as being drier than at present (Eckerle 1997), which would have reduced the prime resources such as water and root plants to only these scarce wet areas. The presence of a heterogeneous environment with only limited resource patches would have forced the hunter-gatherers to choose these optimal localities as campsites and processing areas. Environmental changes after 4,000 years ago following the last significant occupation at the excavated location may have made a focus on the locality less critical than before. Evidence for an important change in the environment comes from the pollen record from Site 48UT375 where the percentage of pine pollen increases dramatically at 4,000 years ago (Cummings 2002). Prior to 4,000 years ago, the pollen record reflects fairly stable vegetation throughout the period of site occupation.

COMPARISONS WITH OTHER LATE PALEOINDIAN SITES IN THE GREEN RIVER BASIN

At least four other sites dating to approximately 8,500 years ago have been excavated in the Green River Basin (Figure 1). The Vegan site (Site 48LN1880), one of the four sites, is situated just above the northern edge of the Hams Fork floodplain at the confluence with an ephemeral drainage (McKern and Creasman 1991). This large floodplain, now cultivated, would have supported similar resources as the drainage playas adjacent to Site 48UT375. At the Vegan site, thirteen 2-x-2-m units, two 1-x-2-m units, and one 1-x-1-m unit were excavated along a pipeline trench, exposing about 37 features. Ten of these units were assigned to Component I, with two of the 16 features dated at 8,400 and 7,570 years ago. This component included 1,078 artifacts including large bifaces, and 37 burned bone fragments recovered. Except for one piece of obsidian, all the toolstone appeared to be from the abundant lag cobbles in the immediate site area. All bone was recovered from feature fill and was extremely fragmented, with none greater than 1 cm in size. These bone fragments were classified mostly as from rabbit-sized animals that were opportunistically collected near the site and processed for maximum nutritional value. The 2-x-2-m excavation unit (Unit 8) containing the feature with the 8,400-year old date had four charcoal-stained basin features (Features 18, 19, 20, and 21) similar in size to those at Site 48UT375. Other associated remains included a scatter of heat-altered rock, a tested cobble, a biface preform fragment from a biface similar in size to those from Site 48UT375, an uniface, and an unshaped mano and a ground slab fragment. The recovery of identified charred seeds from the four features was limited to a Cheno-am seed in Feature 20 and two Cheno-am and three grass seeds from Feature 21, suggesting that seed processing was not an important activity.

Component II at the Vegan site consisted of 10 hearth features, two projectile points, 26 other flaked stone artifacts, 1,948 pieces of debitage, one hammerstone, and one groundstone fragment. Radiocarbon dates from four of the features ranged from 6,080 to 4,878 years ago. Though the excavation areas were small, providing limited information, similar intensive processing during the spring as proposed for Site 48UT375 may have occurred at the Vegan site. These activities appear to have occurred at the Vegan site from about 8,400 years ago through the mid-Holocene to about 4,900 years ago, a similar time period as represented at Site 48UT375.

The Blue Point site (Site 48SW5734) is another site dating to this period located adjacent to playas (Johnson et al. 1999). Excavation of a 112-m^2 block at the Blue Point site yielded remains of a series of occupations (Components A-E) dating between 9,540 and 5,440 years ago. Component B, dating to 8,330 and 8,190 years ago and corresponding to the earliest components at Site 48UT375 and the Vegan site, contained two charcoal-stained basin features with an associated concentration of heat-altered rock. Other recovered material included extensively fragmented and charred bone fragments of small mammals in the size range of rabbit, ground squirrel, and mouse. Debitage, but no temporally diagnostic artifacts, was also associated with the component. The Component B remains are quite comparable to those from Site 48UT375 and the Vegan site, indicating similar activities.

The earlier component at the site, Component A dating to 9,540 years ago and containing Alberta/Cody projectile points, also appears to represent

similar subsistence activities. Encountered remains, in addition to the points, included one hearth feature, lithic debitage, heat-altered rock, and extensively fragmented burned and unburned bone identified mostly as jackrabbit and ground squirrel. Additional components dating to 7,280 years ago (Component C), 6,390 and 6,210 years ago (Component D), and 5,440 years ago (Component E) were also excavated at the site. These components also contained hearth features, heat-altered rock, flaked stone tools, and heavily fragmented small mammal bone, indicating that the site location was used for similar activities throughout the entire period of occupation from 9,540 to 5,440 years ago.

The third site, the Deep Hearth site (Site 48UT786), is situated in a saddle along a ridge just west of Little Muddy Creek, an area that may support resources akin to those found in the wetter areas adjacent to the other sites (Rood and Pope 1993). Features excavated in the 66.75-m^2 block labeled as Component 2 included three charcoal-stained basins with radiocarbon dates of 8610, 8460, and 8220 years B.P., a shallow basin with oxidation, two possible postmolds, a series of other charcoal-stained areas, and a concentration of heat-altered rock forming an arc north of the basins. A total of 33 pieces of debitage, a late Paleoindian projectile point base defined as the Deception Creek type and similar to the one recovered at Site 48UT375, two bifaces of Malad obsidian, a retouched flake, a metate fragment, and a mano was associated with the features. Except for four artifacts of obsidian from the Malad source located approximately 150 km west of the site, the flaked stone material appears to be from local sources. The 50 bone fragments associated with the component represent intensive processing of small mammals, including jackrabbit, on a limited scale. As with the other sites, a few small animals were probably opportunistically trapped near the site during site activities that may have included the extensive processing of resources from the wetter areas near the site. The recovery of charred *Chenopodium* seeds from two of the features may suggest the use of this taxon, but it may represent the natural presence of the seeds in the soil (Bach 1997).

In addition to the 8,610- to 8,220-year old component at the Deep Hearth site, a 51.5-m^2 block was also excavated over a 6,020- to 5,140-year old component (Component 1), representing at least two occupations. As with the other discussed sites, the Deep Hearth site evidences a continuity of subsistence activities and the reuse of a location from at least 8,610 to 5,140 years ago.

Excavations at the final site, Site 48LN1185, yielded evidence of a series of occupations dating between 8,180 and 5,420 years ago within the main excavation block totaling 67 m^2 (McDonald 1993). One charcoal-stained basin feature (Feature 5) with a radiocarbon date of 8,180 years B.P. and a number of late Paleoindian projectile point fragments were recovered. However, these remains could not be separated from the compressed component that also included features dating between 6,500 and 5,420 years ago. The overall component contained nine hearth features; 4,808 pieces of debitage; 115 flake tools; 39 core tools; 87 bifaces including 38 projectile points consisting of Paleoindian, side-notched, and corner-notched types; and 15 pieces of groundstone. A total of only 119 bone specimens was recovered from the excavation block. The extensively fragmented specimens were found mostly in feature fill and consisted of bone from small mammals. About half the specimens were burned. The results from the excavation block at Site 48LN1185 paint a similar picture as the other sites. Information from each of the sites indicate that a location adjacent to a floodplain or playa was revisited and reused from late Paleoindian times through much of the mid-Holocene.

CONCLUSIONS

Overall, the picture emerging from five sites excavated in the Green River Basin suggests that the prehistoric inhabitants during the late Paleoindian period and mid-Holocene selected locations for camp and processing sites based at least in part on the presence of floodplains or playas. These areas probably contained an important resource such as biscuitroot or onion, processing of which required heating rock in basin features. While the major focus of the occupation at these locations was the extensive processing of some resource obtainable from the playas most likely in the spring, small mammals including rabbits, wood rats, and mice were opportunistically captured near the site for immediate consumption. They were

processed for maximum nutritional value.

None of the sites or components dating to the Late Paleoindian period contained evidence for the exploitation of large and medium mammals. This lack of utilization of these larger mammals suggests that they were probably not present within the hunting range of the excavated sites within the lower Green River Basin at least during the time of site occupation. According to the heuristic diet breadth models, foragers will take the more profitable or higher-ranked prey and will ignore lower ranked resources regardless of how common they are in the environment (Kelly 1995). These diet breadth models suggest that if the larger, higher ranked mammals such as bison were available they would have been acquired regardless of the densities of the smaller, lower ranked game. The inhabitants of the lower Green River Basin at about 8,500 years ago were adapting to the local environment and making do with what was available in an area that apparently did not include large and medium mammals.

Each of these sites in the Green River Basin with components dating to approximately 8,500 years ago also had similar remains dating to periods throughout the mid-Holocene to about 5,000 to 4,000 years ago. As with Site 48UT375, block excavations at the four other sites produced evidence of a series of intermittent occupations within the excavated location. The location appears to have been occupied each time to conduct at least some similar activities: the processing of a resource such as biscuitroot acquired from the wetter areas adjacent to the camp, the trapping of small mammals, and the procurement of toolstone.

These visits were generally widely spaced in time, suggesting that individual locations (actual places of occupation) were not the focal point of repeated, regular reuse, and the actual location of the previous occupation did not serve as a draw for future visits. Instead, the prehistoric hunter-gatherers appear to have focused their settlement decisions on the larger locality of which the excavated locations were a part. Each locality probably contained numerous locations that met the criteria for an adequate campsite and the excavated locations were just one of many at each of these localities. The selection of localities containing sandy deposits adjacent to playas or wetter floodplains appear to be some of the critical factors in hunter-gatherer settlement decisions during the mid-Holocene in the Green River Basin. These localities were ideally situated to provide well-drained and protected campsites with access to a diversity of plant and small animals in the immediate area, and water and probably root plants in the adjacent wetter areas. The harvested roots or similar resource could have easily been transported back to the campsite for processing. An often dry, mid-Holocene environment in the Green River Basin probably limited the number of localities across the landscape that would have been ideal for both campsites and for obtaining the required resources from adjacent wetter areas. The limited number and patchy arrangement of these localities within a heterogeneous environment would have necessitated the periodic use of the available localities and would have made them a focal point for repeated occupations for at least some similar activities. These conditions appear to have lasted at least 4,000 years.

The types of recovered remains and the hypothesized subsistence of the inhabitants of the Green River Basin at about 8,500 years ago correspond to Frison's (1976, 1988, 1992, 1997) Foothill-Mountains concept. The sites observed by Frison in the Big Horn Mountains and surrounding areas and those excavated in the Green River Basin both exhibit flaked stone tools made from predominately local material sources, yield only limited numbers of lanceolate laterally constricted projectile points, and represent a subsistence based on resources other than bison. As noted by Frison, the recognized differences appear to be the result of variation in the ecological characteristics of the areas. It appears that during this time at about 8,500 years ago, groups were localized and adapting to local conditions, thus creating much variation in the archaeological record.

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